

FOLIA MEDICA CRACOVIENSIA

Vol. LIX, 3, 2019: 113–122

PL ISSN 0015-5616

DOI: 10.24425/fmc.2019.131140

Progressive muscle relaxation according to Jacobson in treatment of the patients with temporomandibular joint disorders

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Abstract: Significant impact factor and psycho-emotional stress in the etiology of dysfunction indicate the need of the routine approach in the treatment of patients with temporomandibular joint disorders to be changed. The aim of the study was to obtain data, documented test results as to the efficiency of progressive muscle relaxation in the treatment of pain caused by temporomandibular joint disorders, as a supplement to previous methods using occlusal splint and other physical therapies. The study included 100 patients of both sexes, aged from 20 to 35 years who were diagnosed with pain due to temporomandibular joint disorders accompanied with high muscle tension of masticatory muscles which were treatment by relaxation therapy. All patients underwent physical examination, specialized functional examination of the masticatory system in accordance with the Polish version of the study RDC/TMD (The Research Diagnostic Criteria of Temporomandibular Disorders, Axis I — physical assessment, Axis II — assessment of psychosocial status and pain — related disability) and assessment of psycho emotional factor and stress, based on the survey developed for their own purpose. The results of the research were obtained using specialized statistical package “R” i386 3.2.3. The results of examinations after relaxation therapy showed a significant reduction in the intensity of myofascial pain in all patients. Progressive muscle relaxation can be successfully used as an supportive therapy treatment of patient with dysfunction.

Key words: temporomandibular joint disorder (TMD), psychoemotional factor, stress, relaxation therapy.

Introduction

Temporomandibular joint disorders are ranked third among the most common stomatological diseases after dental caries and periodontal problems [1]. Type of dysfunction is determined by environmental, genetic and psycho-emotional factors. It has been observed that increasing level of stress leads to the increase of harmful parafunctional habits in the stomatognathic system whose long-term effect prevents the ability of the organism to compensate and adapt the function, which contributes to the pain within the masticatory system [2, 3]. Nowadays applied methods in treatment of temporomandibular joint disorders are still under investigation. However, they have not been developed effectively yet. Satisfactory methods of masticatory muscle relaxation (with the exception for drug treatment) are only related to mental patients [4]. Significant impact factor and psycho-emotional stress in the etiology of dysfunction indicate the need of the routine approach in the treatment of patients with temporomandibular joint disorders to be changed. The attempt to cooperate with a psychologist may facilitate the effectiveness of traditional rehabilitation of patients with dysfunction [5].

In the 30s of the previous century, Edmund Jacobson developed the method of progressive muscle relaxation, which is based on the premise that mental relaxation should naturally result from physical relaxation. This method teaches patients how to take control over the factors causing stress, with simultaneous relaxation of skeletal muscles, and alternating tension and relaxation deliberately in the next group of striated muscle [6–8]. Data from the literature indicates the usefulness of Jacobson's progressive muscle relaxation method as a supportive therapy for the treatment of neurological disorders, depression, anxiety, bronchial asthma, cardiological condition, peptic ulcer, chronic headache, tinnitus, sleep disorders and psychological treatment of neurological conditions [9–10]. Jacobson's progressive muscle relaxation has not been used in the treatment of temporomandibular joint disorders. The above has become an inspiration to undertake research in this field. The significant impact of psycho-emotional factors and stress on the rise or worsening of dysfunction as well as cooperation with the psychologist can significantly influence the course and treatment of functional disorders. The elimination of psychological components in patients with temporomandibular joint disorders may contribute to the reduction of pain and frequency of parafunctional habits.

The aim of the study was to obtain data, documented test results as to the efficiency of progressive muscle relaxation in the treatment of pain caused by temporomandibular joint disorders, as a supplement to previous methods using occlusal splint and other physical therapies. The study also included the treatment of post-isometric muscle relaxation. In order to ensure an objective comparative

evaluation of these two methods of adjunctive treatment, clinical studies and surveys were conducted. The aim of the study was to answer the following questions:

1. Does the use of Jacobson's progressive relaxation method will be beneficial to reduce pain and improve the functioning of the stomatognathic system being evaluated in clinical trials?
2. Does the relaxation method obtain a positive opinion of the patients and can complement the previously used prosthetic rehabilitation with occlusal splint as well as other physical therapies?
3. Which one of assessed methods (progressive muscle relaxation according to Jacobson and method of post- isometric relaxation) gains an advantage in the treatment used in the adjunctive therapy of temporomandibular joint disorders, and assessment of which according to their impact on muscle relaxation on the basis of the clinical trial and the results of the survey?

Material and Methods

The study included 100 patients of both sexes, aged from 20 to 35 years who were diagnosed with pain due to temporomandibular joint disorders accompanied with high muscle tension of masticatory muscles. The study included patients reported to prosthetic treatment to Department of Prosthodontics at the Jagiellonian University, Medical College in Krakow between 2014 and 2016. Patients were divided into two groups of 50 people each. In the group number I-test group, treatment was performed by progressive muscle relaxation according to Jacobson. In the group number II-control group, post-isometric muscle relaxation treatment was instituted. The following criteria the patients had to meet in order to be included in the study: good general health, painful form of temporomandibular joint disorders with high muscle tension, pain lasting for at least 3 weeks prior to admission, and also patients with full arches without previous orthodontic treatment.

The exclusion criteria included: joint component of functional disorders (pain in the temporomandibular joints, acoustic symptoms), deterioration of the posture resulting from relaxation training (aggravation of muscular pain, worsening of mental state) unstable musculoskeletal system (frequent painful muscle spasms), tetanus, other diseases that prevent the patient from continuing the study (fever), and the lack of the patient's informed consent.

The criterion for the allocation of patients to groups I and II was the consent to perform relaxation treatments for the treatment of functional disorders of the chewing organ and the lack of contraindications. The research was conducted in accordance with the guidelines of the Bioethics Commission of the Jagiellonian University issued in the opinion of 27 February 2014, with KBET/31/B/2014. All patients underwent physical examination, specialized functional examination of the masticatory system in

accordance with the Polish version of the study RDC/TMD (The Research Diagnostic Criteria of Temporomandibular Disorders, Axis I — physical assessment, Axis II — assessment of psychosocial status and pain — related disability) and assessment of psycho emotional factor and stress, based on the survey developed for their own purpose. This study was conducted twice, before the relaxation therapy started and after it.

Relaxation therapy schedule was adapted to clinical and laboratory stages of occlusion splint. For the purposes of the research both physiotherapy and pharmacological treatment were eliminated. Following the purpose of the studies, comparative evaluation of two supporting methods of treatment were undertaken: for the patients with temporomandibular joint disorders, the performance of 5 cycles of progressive muscle relaxation according to Jacobson in the group I — the study one, and 5 cycles of post- isometric muscle relaxation in group II — control. The qualification and assignment of the patients into group I and II were based on the results of clinical and specialist examination. In group I the training was held twice a week and was conducted by a qualified psychologist. Each meeting lasted 45 minutes. The procedure was to tighten the subsequent muscle groups for 5–7 seconds, followed by a 20-second relaxation time. The basic part of the training performed during the first two meetings included alternating tension and relaxation of muscles in the limbs, abdomen and face based on Jacobson's classic training. The next session was modified taking into account the muscles of the neck and face, and the fourth and fifth sessions included exercises with which the patient was familiarized during earlier training, but done separately for each part of the face.

In group II the treatment was conducted by a qualified physiotherapist and also was held twice a week, 45 minutes each, and next exercises were repeated three times.

The results of the research were obtained using specialized statistical package "R" i386 3.2.3. To check the theoretical dependence (hypothesis testing), Chi-square test of Pearson was used. To compare the relationship between the results obtained in clinical trials (comparison between the two dependent samples), Anova parametric test was performed.

Results

The results of physical examination, basic dental examination and specialized functional examination of the masticatory system in accordance with RDC/TMD study performed before relaxation therapy are presented in the Tables 1, 2.

All patients in the group I and II were diagnosed with myofascial pain of three or more masticatory muscles without restricted or limited opening of mouth and increased high muscle tension resulting from irregularity of limited range of mandible movements and the lack of its symmetry detected on physical examination,

basic dental examination and specialized functional examination of the masticatory system in accordance with RDC/TMD study (Axis I and II).

Table 1. Number of patients with masticatory muscles pain.

Pain-location	Masseter muscle	Temporal muscle	Pterygoid muscle	Pain of three masticatory muscles	Pain in more than three masticatory muscles
Group I N = 50	50	38	44	39	11
Group II N = 50	50	36	48	40	10

Table 2. Other symptoms of temporomandibular joint disorders before treatment.

Other symptoms	Idiopathic pain of masticatory muscles	Masticatory muscles pain during mandibular movement	Headache	Deviations of mandibular	Restricted mandibular movements	Sleep problems
Group I N = 50	17	36	32	32	35	29
Group II N = 50	19	33	30	26	27	33

The results of the survey before treatment in both groups indicate the presence of a psycho-emotional factor and stress in patients with temporomandibular joint disorders (Fig. 1).

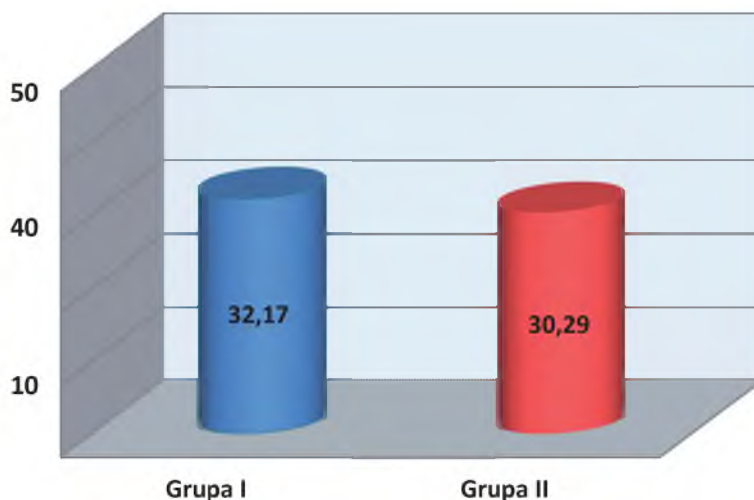


Fig. 1. Graphical presentation of the mean total results of survey carried out before the relaxation treatments in both groups.

The statistical analysis shows that there were no significant differences between responses in both groups (I and II) regardless of the group the patients belong to and what disability level they represent (Table 3).

Table 3. The level of impairment assessed in both groups and statistical significance using the Pearson Chi-square coefficient.

Patients	Level of disability		p-value
	1	2	
Group I N = 50	24	26	0.0023
Group II N = 50	31	19	

The results of physical examination, basic dental examination and specialized functional examination of the masticatory system in accordance with RDC/TMD study performed after relaxation therapy showed a significant reduction in the intensity of myofascial pain in all patients in both groups with a predominance of the therapeutic effect in group I (Tables 4, 5).

Table 4. Number of patients with masticatory muscles pain after relaxation therapy.

Pain-location	Masseter muscle	Temporal muscle	Pterygoid muscle	Pain of three masticatory muscles	Pain in more than three masticatory muscles
Group I N = 50	24	20	26	12	0
Group II N = 50	31	23	33	19	5

Table 5. Other symptoms of temporomandibular joint disorders after treatment.

Other symptoms	Idiopathic pain of masticatory muscles	Masticatory muscles pain during mandibular movement	Headache	Deviations of mandibular	Restricted mandibular movements	Sleep problems
Group I N = 50	8	20	8	17	19	5
Group II N = 50	9	24	12	20	19	20

The results of the surveys prove to be more effective for relaxation treatments in group I compared to the results obtained in group II (Fig. 2).

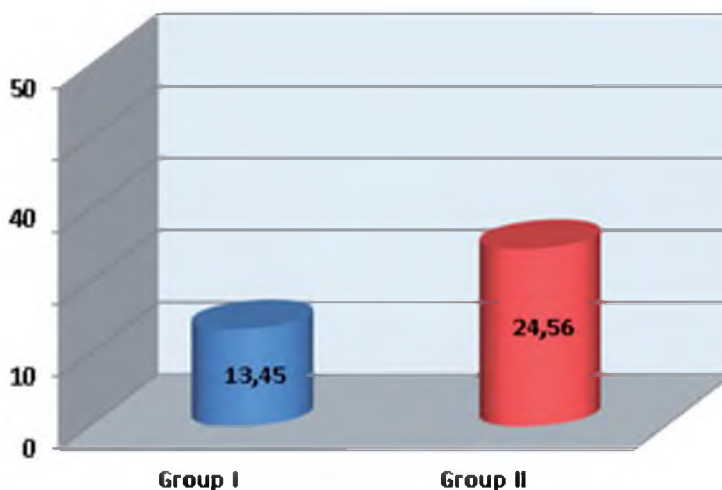


Fig. 2. Graphical presentation of the mean total results of survey carried out after the relaxation treatments in both groups.

A similar analysis of the ANOVA variance was carried out for the final results of the post-treatment relaxation. The test results are presented in Table 6, according to which the final results of the questionnaire completed by patients from groups I and II are significantly different, while the level of impairment has no significant impact on the subjective results of the treatment.

Table 6. P-value values of the results of the survey based on the analysis of ANOVA variance after relaxation procedures.

Analysis of ANOVA variations after relaxation procedures		
Dependent variable	Independent variable	p-value
The total result of the survey	Group (I, II)	0.0000
	Level of impairment	0.5557

Patients also showed willingness to cooperate with a psychologist in the field of education, ways to cope with stress after the completed study and relaxation therapy.

Discussion

Temporomandibular joint disorders are a significant therapeutic problem due to the complex etiology and diagnostic and therapeutic difficulties. Parafunctional habits and neurotic patient dispositions contribute to the formation of the muscle component of dysfunction, manifested by increased tension and pain in the masticatory muscles, as a result of prolonged action of the traumatic factor [11–14]. Golombek recommends

the use of alternative psychotherapeutic methods, such as therapy resulting from body movements so-called motion therapy, self-awareness of developing training, as well as progressive relaxation of Jacobson's muscles in psychiatric patients with severe depressive disorders, personality disorders: depersonalization and / or dissociative phenomena [15]. Canter *et al.* conducted comparative studies assessing the effectiveness of two therapeutic methods: biofeedback and progressive muscle relaxation according to Jacobson in patients with anxiety neurosis. The frontal muscle was selected for analysis and measurement of voltage changes based on EMG in both groups, due to the generalized increase in muscle tension in anxious patients prior to the initiation of relaxation therapy. When analyzing the results of treatment, the authors found that both therapeutic methods are effective, with a slight advantage in the treatment of anxiety using the biofeedback method [16]. Hudchings gives a beneficial therapeutic effect after using a series of Jacobson muscle relaxation training in relieving headaches [17]. The post-isometric relaxation method is used to normalize the hypertonic tone of the muscles, i.e. restoring the normal length and elasticity of the contorted muscles, resulting in a reduction in pain and restoration of the normal range of mandibular movements [18–19]. Available literature includes Blanco who have attempted to evaluate the post-isometric muscle relaxation performance in patients with TMD, manifested by myofascial pain of the masseter muscles and limited mandibular lowering range. The research conducted among 90 patients was aimed at comparing the effectiveness of PIR technique and voltage technique and anti-voltage, so-called SCS-technique. The results of the research indicate an advantage of the therapeutic effect of post-isometric muscle relaxation, the application of which allowed to improve the scope of abduction of the mandible and reduce pain. According to the authors, post-isometric muscle relaxation can be used to treat myofascial pain (trigger points) with or without limited opening of the mouth of the stomatognathic system [20]. When analyzing the results of clinical trials for group I patients who received progressive muscle relaxation according to Jacobson, during the implementation of this research project, the stomatognathic system was found to improve: reduction in pain intensity of rumen muscles, range and symmetry of border movements in all subjects. The results of our own research are consistent with the data published by other authors who found a beneficial effect of the applied post-isometric method of muscle relaxation on the functioning of the stomatognathic system muscles, but with due to the relatively small number of scientific reports and clinical observations, further research in this area is necessary [18–21]. Not without significance is the fact that patients previously instructed by a physiotherapist, do their own muscle exercises at home, which is associated with the lack of monitoring of the correctness and regularity of the exercise. In the conducted studies, the results obtained after the applied relaxation therapy testify to the positive effect of both compared methods on the reduction of pain in the masseter muscles and improvement

in the boundary movements of the mandible, with the predominance of therapeutic effect for the method of progressive muscle relaxation according to Jacobson.

Conclusion

Analysis of the results obtained in the study allows to draw the following conclusions as to the effectiveness of supportive treatment of temporomandibular joint disorders towards progressive muscle relaxation according to Jacobson:

1. The method of muscle relaxation influenced to reduce pain and improve the functioning of the masticatory organ being evaluated in clinical trials.
2. This method received a positive opinion of the patients assessed on the basis of surveys and it may supplement the previously used prosthetic rehabilitation with the use of occlusal splint and physiotherapy.
3. Progressive muscle relaxation according to Jacobson gained an advantage in the treatment of temporomandibular joint disorders over than post- isometric relaxation method based on the improvement of functional analysis of the masticatory organ and of a positive opinion resulting from the survey, and can be successfully used as an supportive therapy treatment of patient with dysfunction.

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